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APPLICATION FOR UNITED STATES PATENT

METHOD AND APPARATUS KIT FOR DEMONSTRATING ARCHIMEDES' PRINCIPLE

INVENTOR: Richard R. Lewellen

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METHOD AND APPARATUS KIT FOR DEMONSTRATING ARCHIMEDES' PRINCIPLE

BACKGROUND

The present invention is in the field of science lab equipment. More specifically this invention relates to demonstrating a specific principle, particularly Archimedes' Principle.

When teaching scientific principles in a classroom setting, demonstrations are a very helpful learning tool. Archimedes' principle states that a body wholly or partially immersed in a fluid will be buoyed up by a force equal to the weight of the fluid it displaces. A kit is desired which could demonstrate various aspects of Archimedes' principle, which would include almost everything needed to perform the demonstration, and which would be simple to use.

SUMMARY OF THE INVENTION

An apparatus kit for demonstrating Archimedes' principle comprises a tub for holding fluid, wherein the tub has sides, and further has an overflow spout, such that when a fluid level reaches the overflow spout, all additional fluid added to the tub will flow out of the overflow spout; and a stable boat sized to float in the tub without touching the sides of the tub. The kit may further comprise a balance beam which can balance on a top edge of the tub sides, wherein the balance beam comprises a first end and a second end, wherein the first end has a first means for attaching weight, and the second end has a second means for attaching a sample weight such that the sample weight attached to the second end will be submerged in the fluid in the tub when the balance beam is balancing on the top edge of the tub sides.

Further provided is a method for demonstrating Archimedes' principle showing buoyancy for a floating object, which comprises the steps of filling a tub with a fluid to the point of overflow, wherein the tub has sides, and further has an overflow spout, such that when a fluid level reaches the overflow spout, all

additional fluid added to the tub will flow out of the overflow spout and will be designated as overflow fluid; placing an overflow catcher under the overflow spout to catch all overflow fluid; placing a boat in the tub, wherein the boat is a stable boat, sized to float in the tub without touching the sides of the tub; placing weights into the boat, wherein the weights are not enough to make the boat sink; weighing the overflow fluid which has flowed into the overflow catcher as a result of placing the boat and weights in the fluid; and, comparing the weight of the overflow fluid to the combined weight of the boat plus the weights placed in the boat.

Further there is a method for demonstrating Archimedes' principle showing buoyancy for an object which does not float, comprising the steps of filling a tub with a fluid to the point of overflow, wherein the tub has sides and wherein the sides have a top edge, and wherein the tub further has an overflow spout, such that when a fluid level reaches the overflow spout, all additional fluid added to the tub will flow out of the overflow spout and will be designated as overflow fluid; placing an overflow catcher under the overflow spout to catch all overflow fluid; placing a first sample weight into the fluid; weighing the overflow fluid which has flowed into the overflow catcher; balancing a balance beam on a top edge of the tub sides, wherein said balance beam comprises a first end and a second end, wherein said first end has a first means for attaching weight, and said second end has a second means for attaching sample weight such that the sample weight attached to said second end will be submerged in the fluid in said tub when the balance beam is balancing on the edge of the tub; attaching the sample weight to the beam second end; attaching a counter weight or weights to the beam first end, until the beam is again balanced on the top edge of the tub side; weighing the counter weights; and comparing the weight of the sample weight to the combined weight of the overflow fluid plus the weight of the counter weights.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is an isometric view of an apparatus kit for demonstrating Archimedes' principle according to an aspect of the invention.

FIGURE 2 is an isometric view of an apparatus kit in use for demonstrating Archimedes' principle according to an aspect of the invention.

FIGURE 3 is an isometric view of an apparatus kit for demonstrating Archimedes' principle according to an aspect of the invention.

FIGURE 4 is an isometric view of an apparatus kit for demonstrating Archimedes' principle according to an aspect of the invention.

FIGURE 5 is an isometric view of a balance beam according to an aspect of the invention.

FIGURE 6 is a cross-section view from FIGURE 3, according to an aspect of the invention.

FIGURE 7 is a cross-section view from FIGURE 3, according to an aspect of the invention.

DETAILED DESCRIPTION

Various aspects of the invention are presented in Figures 1-7 which are not drawn to scale and in which like components are numbered alike. Referring now to Figures 1-2, according to an aspect of the invention, an apparatus kit **1** for demonstrating Archimedes' principle comprises a tub **10** for holding fluid wherein the tub **10** has sides **15**, and a stable boat **20** sized to fit in the tub **10** without touching the sides **15** of the tub **10**. The tub **10** has an overflow spout **12**, such that when a fluid level **14** reaches the overflow spout **12**, all additional fluid added to the tub **10** or displaced by the boat **20** will flow out of the overflow spout **12**. This kit is useful for demonstrating buoyancy for a floating object.

According to a further aspect of the invention, the kit **1** further comprises weights **22** which are sized to fit in the boat **20** without sinking the boat **20**.

Referring now to figures 3-7, in another embodiment of the invention, an apparatus kit **1** for demonstrating Archimedes' principle comprises a tub **10** for holding fluid wherein the tub **10** has sides **15**, and a balance beam **30**. The tub **10** has an overflow spout **12**, such that when a fluid level **14** reaches the overflow spout **12**, all additional fluid added to the tub, or displaced by the boat **20,** will flow out of the overflow spout **12**. The tub **10** sides **15** have a top edge **16**. The balance beam **30** can balance on a top edge **16** of the tub sides **15**, and comprises a first end **32** and a second end **34**, wherein the first end **32** has a first means **31** for attaching a counter weight **22** or weights, and the second end **34** has a second means **33** for attaching a sample weight **36**. The beam **30** is configured such that the sample weight **36** attached to the second end **34** will be submerged in the fluid in the tub **10** when the balance beam **30** is balancing on an edge **16** of the tub **10** (see figure 7). The top edge **16** of the tub sides **15** may further comprise a fulcrum **18**, for balancing the balance beam **30**. This kit is useful for demonstrating buoyancy with objects that do not float.

According to another aspect of the invention, the first means **31** for attaching counter weight **22** to the first end **32** comprises a tray **37** hanging from a groove **38** in the first end **32**.

In a preferred embodiment of the invention, the balance beam **30** further comprises an adjustment means **39**, for adjusting the center of gravity of the balance beam **30**, to allow the balance beam **30** to be balanced on the edge of the tub. According to a further aspect of the invention, the adjustment means **39** is an adjustment screw on the balance beam second end **34**, which can be turned in or out.

The kit **1** may further comprise sample weights **36** of simple geometric shape, which can be attached to the balance beam second end **34**. The simple geometric shape, such as a rectangular or circular extrusion, is useful because it allows for easier calculation of the volume of the sample weight. This is helpful because part of the demonstration may focus on the volume of water displaced.

According to a preferred embodiment of the invention, the two kits above could be combined into a kit which could be used for demonstrating Archimedes'

principle both for the buoyancy of a floating body, and the buoyancy for objects that do not float. This kit comprises a tub **10** for holding fluid wherein the tub **10** has sides **15** having a top edge **16**, a stable boat **20** sized to float in the tub **10** without touching the sides **15**, and a balance beam **30** which can balance on an edge **16** of the tub sides **15**. Each of these elements are the same as described above. According to a further aspect of this invention, the combined kit further comprises weights **22** which are sized to fit in the boat **20** without sinking the boat **20**.

According to a further aspect of this embodiment, the first means **31** for attaching counter weight **22** to the balance beam first end **32** comprises a tray **37** hanging from a groove **38** in the first end **32**.

According to another aspect of this invention, the balance beam **30** further comprises an adjustment means **39**, for adjusting the center of gravity of the balance beam **30**, to allow the balance beam **30** to be balanced on an edge **16** of the tub sides **15**. According to a further aspect of this invention, this adjustment means **39** is an adjustment screw on the balance beam first end **32**, which can be turned in or out.

Sample weights **36** of simple geometric shape may also be included in the kit according to an aspect of the invention. These sample weights should be attachable to the balance beam second end **34** such that when attached, each sample weight **36** is submersed under the fluid **13** (when the tub **10** is full of fluid).

The top edge **16** of the tub sides **15** may further comprise a fulcrum **18** for balancing the balance beam **30**.

According to a preferred embodiment of the invention, a method for demonstrating Archimedes' principle showing buoyancy for a floating object comprises the following steps. Fill a tub **10** with a fluid **13** to the point of overflow, wherein the tub **10** has sides **15**, and further has an overflow spout **12**, such that when a fluid level **14** reaches the overflow spout **12**, all additional fluid added to the tub **10** will flow out of the overflow spout **12** and be designated as overflow fluid **9**. Next, place an overflow catcher **11** under the overflow spout **12**

to catch all overflow fluid **9**. The overflow catcher **11** could be anything capable of holding fluid, with a top open enough to catch all the overflow. Two examples are a beaker or a cup.

Next, place a boat **20** in the tub **10**, wherein the boat **20** is a stable boat, sized to float in the tub **10** without touching the sides **15** of the tub **10.** Then place weights **22** into the boat **20**, wherein the weights **22** are not enough to make the boat **20** sink.

Next, weigh the overflow fluid which has flowed into the overflow catcher **11**, and compare the weight of the overflow fluid **9** to the combined weight of the boat **20** plus the weights **22** placed in the boat **20**.

According to another aspect of the invention, a method for demonstrating Archimedes' principle showing buoyancy for an object which does not float comprises the following steps. Filling a tub **10** with a fluid to the point of overflow, wherein the tub **10** has sides **15** and wherein the sides **15** have a top edge **16**, and further wherein the tub **10** has an overflow spout **12**, such that when a fluid level **14** reaches the overflow spout **12**, all additional fluid added to the tub will flow out of the overflow spout **12** and be designated as overflow fluid **9**. Then place an overflow catcher **11** under the overflow spout **12** to catch all overflow fluid **9**. Next place a sample weight **36** into the fluid **13.** Then weigh the overflow fluid **9** which has flowed into the overflow catcher **11**.

Next, balance a balance beam **30** on a top edge **16** of a tub side **15.** The balance beam **30** comprises a first end **32** and a second end **34**, wherein the first end **32** has a first means **31** for attaching weight **22**, and the second end **34** has a second means **33** for attaching a sample weight **36** such that the sample weight **36** attached to the second end **34** will be submerged in the fluid **13** in the tub **10** when the balance beam **30** is balancing on the top edge **16** of the tub side **15.**

Then attach the sample weight **36** to the balance beam second end **34**. Next attach a counter weight or weights **22** to the balance beam first end **34**, until the balance beam **30** is again balanced on the top edge **16** of the tub side **15.**

Weigh the counter weights **22**, and compare the weight of the sample weight **36** to the combined weight of the overflow fluid **9** plus the weight of the counter weights **22**.